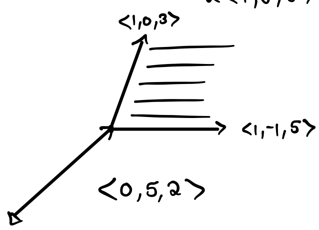
16.6.1

$\vec{r}(u,v) = \langle u+v, 5-v, 2+3u+5v \rangle$

What is this surface?

$\vec{r}(u,v) = \langle u, 0, 3u \rangle + \langle v, -v, 5v \rangle + \langle 0,5,2 \rangle$

$= u\langle 1,0,3 \rangle + v\langle 1,-1,5 \rangle + \langle 0,5,2 \rangle$

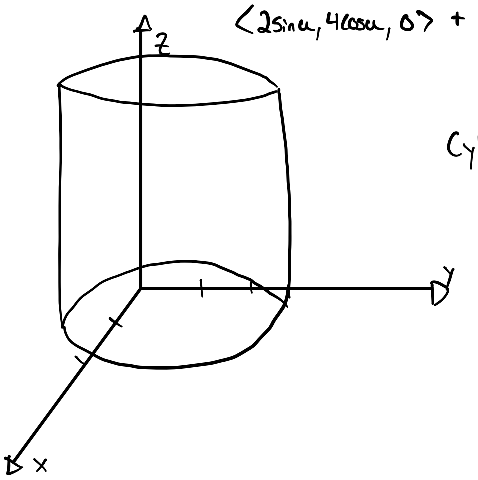


This is a plane

16.6.2

$\vec{r}(u,v) = \langle 2\sin u, 4\cos u, v \rangle \qquad 0 \le v \le 4$

$\langle 2\sin u, 4\cos u, 0 \rangle + \langle 0,0,v \rangle$



Cylinder

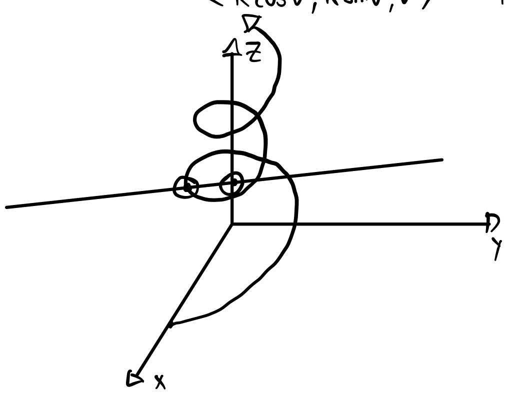
16.6.3

$\vec{r}(u,v) = \langle u\cos v, u\sin v, v \rangle$

$k = u = \text{constant}$

The grid curve is

$\langle k\cos v, k\sin v, v \rangle$ Helix



16.6.4

$\hat{i} - \hat{j}$ & $\hat{j} - \hat{k}$

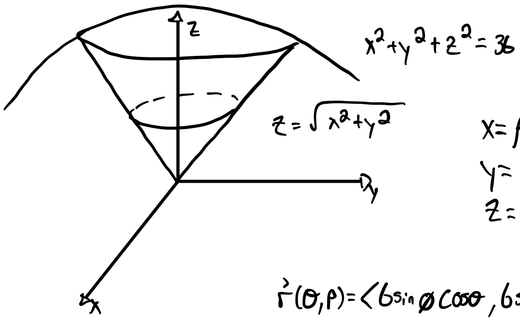
$x(u,v) = 0 + u \cdot 1 + v \cdot 0$

$y(u,v) = 0 + u(-1) + v(1)$

$z(u,v) = 0 + u(0) + v(-1)$

$\vec{r}(u,v) = \langle u, -u+v, -v \rangle$

16.6.5

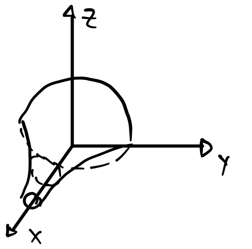


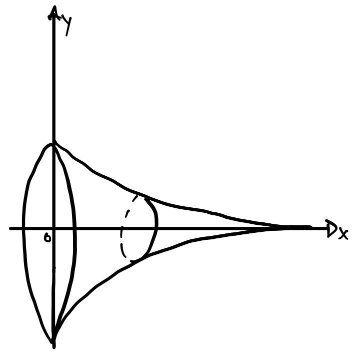
$x=\rho\sin\phi\cos\theta$
$y=\rho\sin\phi\sin\theta$
$z=\rho\cos\phi$

$0\le\theta\le2\pi$
$0\le\phi\le\frac{\pi}{4}$

$\vec{r}(\theta,\rho)=\langle 6\sin\phi\cos\theta, 6\sin\phi\sin\theta, 6\cos\phi\rangle$

16.6.6 $y=e^{-x}, 0\le x\le 3$





$x=u$
$y=e^{-u}\cos v$
$z=e^{-u}\sin v$

16.6.7 $x=u+v$, $y=6u^2$ $z=u-v$ $(2,6,0)$

Two vectors in the tangent plane
$\frac{\partial\vec{r}}{\partial u}$ & $\frac{\partial\vec{r}}{\partial v}$

$x=u+v$
$y=6u^2$
$z=u-v$

$\vec{r}_u=\langle 1, 12u, 1\rangle$
$\vec{r}_v=\langle 1, 0, -1\rangle$

$\vec{r}_u=\langle 1, 12, 1\rangle$
$\vec{r}_v=\langle 1, 0, -1\rangle$

$$\begin{vmatrix} 1 & 12 & 1 \\ 1 & 0 & -1 \end{vmatrix}$$

$\langle 12(-1)-1(0), 1(1)-1(-1), 1(0)-12(1)\rangle$
$\langle -12-0, 1+1, -12\rangle$
$\langle -12, 2, -12\rangle$

$u+v=2$
$6u^2=6$
$u-v=0$

$u=1$ $v=1$

$-12(x-2)+2(y-6)-12(z-0)=0$
$-12x+24+2y-16-12z=0$
$-12x+2y-12z=-8$